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August 6, 2020

VIA ELECTRONIC COMMENT FILING SYSTEM

Marlene H. Dortch
Secretary
Federal Communications Commission
445 12th Street, SW
Washington, DC 20554

Re: *Ex Parte* Submission for the Record
GN Docket Nos. 18-122, 20-173

Dear Ms. Dortch:

Intelsat License LLC ("Intelsat") filed a notice of *ex parte* meeting on August 4, 2020 in which it referenced an analysis performed by Dr. Paroma Sanyal, Senior Consultant at The Brattle Group.[1] The analysis is contained in the attached white paper – "Allocating Costs for Multi-band Payloads on the C-Band Satellities." Among other things, the white paper "concludes that the Commission appropriately adopted an incremental cost methodology to address the issue of additional functionality on replacement satellites and that other methods advocated for consideration by commenters would be distortive and create economic inefficiencies."[2]

Intelsat continues to make progress in carrying out the complex and carefully coordinated activities detailed in its Transition Plan and supports the Commission's approach whereby satellite operators are expected to "reasonably allocate the incremental costs of . . . additional functionalities to itself and only seek reimbursement for the costs reasonably allocated to the needed relocation."[3] This methodology is consistent with the Commission's *Emerging Technologies* framework and was relied upon by Intelsat in its years-long planning process that yielded its C-band Transition Plan.

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[1] *See* Intelsat License LLC Notice of *Ex Parte* Meeting, 6-7 (Aug. 4, 2020), https://ecfsapi.fcc.gov/file/1080467946484/Ex%20Parte%20Meeting%20Restoration%20Service%20and%20Cost%20Allocation%20-%20Intelsat%208-4-2020.pdf.

[2] *Id.* at 6.

[3] Expanding Flexible Use of the 3.7 to 4.2 GHz Band, *Report and Order & Order of Proposed Modification*, 35 FCC Rcd. 2343, para. 194 (2020).

Please contact the undersigned with any questions regarding this matter.

Respectfully submitted,

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Allocating Costs for Multi-band Payloads on the C-Band Satellites

PREPARED FOR

Intelsat License LLC

PREPARED BY

Paroma Sanyal

August 6, 2020

THE Brattle GROUP

Notice

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I. Introduction

The Federal Communication Commission (FCC) has made the availability of 5G-capable spectrum a priority, as outlined in their 5G FAST Plan.[1] A majority of low-band spectrum is already allocated to commercial mobile use, and significant amounts of high-band spectrum have been allocated for use in the past year.[2] Thus, the FCC has turned the spotlight on mid-band frequencies as the bands needed for growing 5G networks.[3] Amongst the mid-band spectrum, the C-band is seen as having the greatest potential for an efficient 5G deployment.[4] As stated by Chairman Pai, the C-band plan "will give everyone a fair chance to compete for this 5G spectrum, while preserving availability of the upper 200 MHz of the band for continued delivery of programming."[5]

Out of 500 megahertz of the C-band spectrum (3.7 – 4.2 GHz), the lower 300 megahertz will be transitioned away from satellite operations, and 200 megahertz will be reserved for satellite operations.[6] Of this 300 megahertz, 280 megahertz will be auctioned by the FCC starting December

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1 FCC, "The FCC's 5G FAST Plan," accessed December 4, 2019, https://www.fcc.gov/5G.

2 Bevin Fletcher, "FCC Wraps up Third Millimeter Wave 5G Spectrum Auction," March 6, 2020, Accessed July 3, 2020, https://www.fiercewireless.com/5g/fcc-wraps-up-third-millimeter-wave-5g-spectrum-auction. See also Coleman Bazelon and Paroma Sanyal, "Mobile Broadband Spectrum: A Revaluation in a 5G World," Prepared for CTIA, May 29, 2019.

3 Kelly Hill, "FCC Pivots to Midband Spectrum," RCR Wireless, May 13, Accessed July 3, 2020, 2019, https://www.rcrwireless.com/20190513/5g/fcc-pivots-to-midband-spectrum.

4 Marco Contento, "C-band Spectrum: The Next Step Toward Bringing 5G to Life," Telit, December 4, 2019, accessed July 29, 2020, https://www.telit.com/blog/C-band-spectrum-the-next-step-towards-bringing-5g-to-life/.

5 David Shepardson, "FCC chairman Pai backs public auction to free up spectrum in C-band for 5G," November 19, 2019, Accessed July 5, 2020, https://www.reuters.com/article/us-usa-wireless/fcc-chairman-pai-backs-public-auction-to-free-up-spectrum-in-c-band-for-5g-idUSKBN1XS26C.

6 FCC, "In the Matter of Expanding Flexible Use of the 3.7 to 4.2 GHz Band," Report and Order, ¶ 130, GN Docket No. 18-122, Adopted February 28, 2020, https://docs.fcc.gov/public/attachments/FCC-20-22A1.pdf, ("C-band R&O")

8, 2020.[7] The FCC has proposed, that of this 280 megahertz, 100 megahertz in the top 46 PEAs will be subject to a Phase I clearing schedule (by December 2021) and the rest will be cleared three years from the date of the auction (by December 2023) with a final clearing deadline of December 2025.[8] The FCC has provided guidelines for "reasonable relocation costs" (arising from this accelerated clearing of the C-band) that can be reimbursed.[9]

Here is a brief summary of the Commission's guidelines for reimbursable costs as laid out in the C-band Report and Order.[10]

- "… compensable costs will include *all reasonable* engineering, equipment, site and FCC fees, as well as any reasonable, additional costs that the incumbent space station operators … *may incur as a result of relocation*."[11]
- "'Reasonable' relocation costs are those necessitated by the relocation in order to ensure that incumbent space station operators continue to be able to *provide substantially the same or better service*."[12]
- "… we intend to allow reimbursement for the cost of that equipment and recognize that this equipment necessarily may include *improved functionality beyond what is necessary to clear the band*."[13]
- " … if an incumbent builds additional functionalities into replacement equipment that are not needed to facilitate the swift transition of the band, it must reasonably allocate the *incremental* costs of such additional functionalities to itself and only seek reimbursement for the costs reasonably allocated to the needed relocation."[14]

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7 FCC, "Auction of Flexible Use Service Licenses in the 3.7-3.98 GHz Band for Next Generation Wireless Services," Public Notice, ¶ 2, AU Docket No. 20-25, July 16, 2020, https://docs.fcc.gov/public/attachments/DOC-365577A1.pdf, ("Auction 107 PN"). Note that there is a 20 megahertz guardband. So a total of 300 megahertz of spectrum is being cleared.

8 "C-band R&O," ¶¶ 155, 193.

9 "Auction 107 PN," ¶ 105.

10 "C-band R&O."

11 "C-band R&O," ¶ 193. Italics added for emphasis.

12 "C-band R&O," ¶ 194. Italics added for emphasis.

13 "C-band R&O," ¶ 194. Italics added for emphasis.

14 "C-band R&O," ¶ 194. Italics added for emphasis.

This paper discusses why the current FCC approach to reimbursing C-band transition costs makes economic sense. In the sections that follow, I discuss three issues: (i) the current FCC cost reimbursement methodology (ii) why this methodology makes economic sense, and (iii) why alternative proposals by commenters do not align with economic principles.

II. Current FCC Cost Reimbursement Methodology

The FCC has long relied upon the "Emerging Technologies" framework (ETF) to balance "the interest of new licensees seeking early entry into their respective bands in order to deploy new technologies and services with the need to minimize disruption to incumbent operations used to provide service to customers during the transition."[15] The ETF recognizes the tradeoff inherent in reallocating spectrum from current uses to new higher value uses. The loss to incumbents (and their customers) from such a reallocation should be minimized, and the incumbents should be provided with appropriate incentives to cooperate and create value. Here the FCC uses the ETF to transition the C-band and creates even greater benefits from accelerating that transition. In line with the ETF approach, the benefits created through reallocating the C-band spectrum and accelerating its availability must be balanced with the need to be fair to incumbents while incentivizing them to clear the spectrum faster.

In light of these objectives, the Commission had adopted the guidelines mentioned earlier for the C-band cost reimbursement. As an initial matter, there are a few points worth highlighting.

- The transition costs arise because a significant amount of the C-band spectrum is being cleared and the same services need to be provided using 200 megahertz instead of 500

[15] FCC, "Amendment of Part 2 of the Commission's Rules to Allocate Spectrum Below 3 GHz for Mobile and Fixed Services to Support the Introduction of New Advanced Wireless Services, Including Third Generation Wireless Services, Ninth Report and Order and Order, ET Docket No. 00-258 and WT Docket No. 02-353, FCC No. 06-45, ¶ 11, adopted Apr. 12, 2006.

megahertz of spectrum. In the normal course of business, every company optimizes their production path given a set of assumptions about inputs, costs, expected demands, state of technology, depreciation of equipment, and so on.[16] When regulatory changes cause the rules of the game to change *expost*, i.e. after production decisions have been made, it alters expectation about input (spectrum) availability and production schedules and costs. The firm then has to deviate from its optimally planned path to produce the same quantity and quality of services, with a decreased quantity of spectrum input. This is what underlies the cost reimbursements in this case.

- The ETF, as discussed earlier, attempts to balance the benefits of spectrum reallocation and acceleration with the need to minimize disruption to incumbents and the need to make them whole.[17] This usually implies replacement of current capabilities. Often services are relocated to a different spectrum band and the costs of relocation are paid.[18] It is worth noting, that for the C-band, the satellite firms are not being relocated to a different spectrum band, but will be moving from using the entire 500 megahertz to the upper 200 megahertz of the band.[19] The reimbursement payment is intended to cover all costs borne by the satellite operators and their customers, such that a lower quantity of input (200 megahertz of spectrum compared to 500 megahertz) can provide the same service to customers.[20]

- Additionally, the Commission, in adopting its incremental cost methodology, is paying less than what it would take to replace the all the existing functionality of the current Intelsat satellites that contain non-C-band payloads. The Commission has adopted the incremental

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[16] University of Chicago, "Profit Maximization," Chapter 6, http://home.uchicago.edu/~vlima/courses/econ201/pricetext/ProfMax.pdf.

[17] "C-band R&O," ¶¶ 21, 214.

[18] FCC, "In the Matter of Amendment of Part 2 of the Commission's Rules to Allocate Spectrum Below 3 GHz for Mobile and Fixed Services to Support the Introduction of New Advanced Wireless Services, including Third Generation Wireless Systems," Eight Report and Order, Fifth Notice of Proposed Rule Making and Order, ¶ 31, ET Docket No. 00-258, Adopted September 23, 2005, https://docs.fcc.gov/public/attachments/FCC-05-172A1.doc.

[19] "C-band R&O," ¶ 21.

[20] "C-band R&O," ¶ 111.

cost methodology and has defined "incremental costs" as any incurred that "are not needed to facilitate the swift transition of the band."[21] Intelsat concluded that non-C-band payloads would be considered incremental costs that have to be paid for by the satellite operator (even if the non-C-band functionalities already existed in the original satellite). Thus, Intelsat based its replacement satellite production decisions on the assumption that it would pay for any ancillary payloads while the FCC pays for the C-band satellite standalone costs.[22]

- When replacing the equipment to provide the same service, it is logical and economically efficient to replace it with the best available technology that is currently available on the market subject to a cost constraint. The FCC itself has recognized this, and has agreed, "to allow reimbursement for the cost of that equipment and recognize that this equipment necessarily may include *improved functionality beyond what is necessary to clear the band*."[23] It would be a waste of public resources to replace, say, 5-year old existing equipment with equipment of the same vintage, when better equipment existed for similar cost.

III. The Incremental Cost Methodology Adopted by the Commission Makes Economic Sense

The framing issue for cost allocation is the idea that multiproduct industries with economies of scope (i.e. it is cheaper to produce the two goods together than separately) should optimize the joint production decision. Producing the two goods separately would lead to duplication

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21 "C-band R&O," ¶ 194.

22 Intelsat, "Notice of Ex Parte Meeting, GN Docket Nos. 18-122, 20-173," pp. 7, 9, August 4, 2020, ("Intelsat ExParte, August 4, 2020").

23 "C-band R&O," ¶ 194. Italics added for emphasis.

of costs, non-optimal output levels and economically inefficient outcomes. In this case, and as the Commission recognized in the Report and Order, any joint C-band and ancillary payloads should not be prohibited, and in fact should be jointly optimized to the extent possible.[24] In economics, the concept of joint production and the resulting need to allocate costs are common, especially in the case of regulated industries, where incorrect allocation may lead to distorted pricing,[25] The incremental cost approach is a well-accepted method for allocating costs in the context of joint production.[26]

The incremental cost of the ancillary payload, as defined by the Commission and implemented by Intelsat, is:[27]

Incremental Cost of Ancillary Payload =

Total Cost of Spacecraft (Cost of C-band Payload plus Ancillary Payload)

Minus

Cost of C-band Only Spacecraft

This aligns with the definition of how incremental costs are calculated in economics and financial accounting, where individual users are ranked in order, and the first, or primary user, is allocated the cost of a stand-alone user, and then the additional user is allocated the additional cost that arises from two users rather than one.[28]

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[24] "C-band R&O," ¶ 194.

[25] The provision of commercial satellite services is not a price-regulated industry.

[26] Joshua S. Gans and Stephen P. King, "Comparing Alternative Approaches to Calculating Long-Run Incremental Cost," pp. 2-5, June 1, 2004, https://www.researchgate.net/profile/Joshua_Gans/publication/252893401_Comparing_Alternative_Approaches_to_Calculating_Long_Run_Incremental_Cost/links/0c96053b3fa5648d9b000000.pdf

[27] "Intelsat ExParte, August 4, 2020," p. 7.

[28] EMBA 5412 "Cost and Revenue Allocations," Slide 41, Fall 2010, http://users.metu.edu.tr/mugan/EMBA%205412%20Cost%20and%20Revenue%20Allocation.ppt.

Intelsat's cost allocation approach will pay for any incremental cost of putting ancillary payloads on C-band satellites, and this aligns with the FCC mandate. The Government is not subsidizing the ancillary payload, as Intelsat will pay any extra cost. There is no ambiguity as to what incremental cost implies in this context. It would be a misinterpretation of the Order to argue that the base cost of the satellite needs to be allocated between the C-band and ancillary payloads. The base cost of the C-band replacement satellite is not incremental cost.

An issue raised by certain commenters is cross-subsidization – the C-band reimbursement subsidizing ancillary payloads [29] In theory, if costs are misallocated, it may lead to cross-subsidization of other services, especially in a regulated context. A threshold question here is that, if Intelsat follows the incremental cost methodology laid out by the Commission, is there any cross-subsidization of the ancillary payload in the C-band transition cost reimbursement context? The answer is no.

In his seminal paper on public enterprises, Gerald Faulhaber proposes an incremental cost test to detect cross-subsidization.[30] According to Faulhaber - "If the provision of any commodity (or group of commodities) by a multicommodity enterprise subject to a profit constraint, leads to prices for the other commodities no higher than they would pay by themselves, then the price structure is subsidy-free."[31] Simply put, the incremental cost test says that if the added revenue from the ancillary service/good is greater than the added (incremental) cost, then the service is subsidy free.[32] An implication is that, if there is any cross-subsidization, then "any consumer group would be better off on a stand-alone basis." He illustrates this point with an example where a train line connects two large cities, and also serves a small town between them. He posits that as long as the fares charged for the small town covers the incremental cost of service such as ticketing and station

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[29] Comments of Eutelsat, S.A., "In the Matter of Expanding Flexible Use of the 3.7 GHz to 4.2 GHz Band," GN Docket No. 18-122, p. 5-6, May 14, 2020.

[30] Gerald R. Faulhaber, "Cross-Subsidization: Pricing in Public Enterprises," The American Economic Review, Vol. 65, No. 5, Dec., 1975, pp. 966-977, ("Faulhaber, Cross-Subsidization: Pricing in Public Enterprises, 1975").

[31] "Faulhaber, Cross-Subsidization: Pricing in Public Enterprises, 1975," p. 966. Note that his analysis is for regulated firms, where the cost allocation scenario is mostly applicable.

[32] "Faulhaber, Cross-Subsidization: Pricing in Public Enterprises, 1975," p. 974.

costs for the small town, the large cities (which bears all the common cost) is not subsidizing the small town.[33]

This situation, in principle, is similar in many respects to the current context of the C-band and ancillary payloads. The dissimilarity is that satellite services are not price or profit regulated businesses, so fixed cost allocation concerns do not directly influence prices. As to the similarities, the revenues from the ancillary payloads will be sufficient to cover the incremental cost of putting the payloads on the C-band satellites.[34] Thus, it fulfils Faulhaber's incremental cost test of no-subsidy. Additionally, it seems clear based on evidence in the record from satellite manufactures, that C-band service prices will not be lower if the ancillary payload is not included in the satellite. The C-band and other ancillary band quantities are fixed, the market is competitive, and there is little incentive to lower prices, and thus the cost allocation is subsidy free.[35]

IV. Cost Methodology Suggestions by Commenters Go Against the Commission's Adopted Methodology and Economic Efficiency

Eutelsat and other commenters have criticized the Commission's incremental cost allocation methodology for this particular application of the ETF. Below, I respond to some of their claims.

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33 "Faulhaber, Cross-Subsidization: Pricing in Public Enterprises, 1975," p. 966.

34 "Intelsat ExParte, August 4, 2020," p. 8.

35 Note that with interrelated demand passing the incremental cost test doesn't necessarily means subsidy free, but it is not applicable here as the amount of C-band capacity is fixed, and the proportion of all Ku-band spectrum used by Intelsat on any of the replacement satellites constitutes only a small proportion of the entire band, and thus there is no ability to affect market prices.

- "There is no supportable basis for the upper end of the Cost Catalog's proposed ranges and it would be plainly unreasonable to reimburse those amounts," and "would improperly subsidize non-C-band satellite costs," that would "unduly advantage larger C-band incumbents, and distort competition."[36] "Allowing such reimbursement without appropriate allocation would result in subsidization by U.S. 5G consumers.."[37] "Hybrid satellites necessarily entail a range of higher costs,…."[38]

  In the Cost Schedule published by the Commission, there are two ranges of satellite costs – a low range and a high range.[39] The low estimates are between $120 - $240 million and the high-cost estimates are between $450 – 768 million depending on single or tandem launch.[40] The low cost estimates are based on satellites with standard C-band payloads with capabilities needed to clear the 300 megahertz of spectrum.[41] High cost estimates assume that the acceleration of the spectrum clearing schedule, "testing and verification of ground relocation equipment over the satellite in under 24 months and/or the potential to "backstop" other satellite builds as a fail-safe to delays," and other reliability and redundancy requirements may push up satellite build costs. [42] Despite Eutelsat's claim of multi-band satellites costing more, the current Intelsat satellites fall in the lowest range of the cost schedule.[43] This is in line with the

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36 "Eutelsat Comments May 14, 2020," p. 5.

37 Echostar, Huges and Inmarsat, "Proposed Guidance on Cost-Recovery for C Band FSS Transition GN Docket No. 18-122," p. 2, July 24, 2020.

38 Comments of Eutelsat S.A., "In the Matter of Expanding Flexible Use of the 3.7 GHz to 4.2 GHz Band," GN Docket No. 18-12, p. 6, May 14, 2020, ("Eutelsat Comments May 14, 2020").

39 FCC, "Wireless Telecommunications Bureau Seeks Comment on Preliminary Cost Schedule for 3.7-4.2 GHz Band Relocation Expenses," DA 20-457, Released April 27, 2020, ("FCC Cost Schedule Comment April 27, 2020")

40 "FCC Cost Schedule Comment April 27, 2020," Attachment, Table II-B-1, pp. 3-4.

41 "FCC Cost Schedule Comment April 27, 2020," Attachment, pp. 3-4.

42 "FCC Cost Schedule Comment April 27, 2020," Attachment, pp. 3-4.

43 Compare Intelsat, "Submission for the Record – Transition Plan," Attach., p. 15, 51, June 19, 2020 ("$113 million per satellite" or approximately $168 million inclusive of launch vehicle and insurance costs), with, "C-band R&O," ¶ 210 ("$160-250 million in capital costs for each satellite"); FCC, "Wireless Telecommunications Bureau Releases Final Cost Category Schedule for 3.7-4.2 GHz Band Relocation

Commission's guidelines on deploying more efficient satellites when possible, to replace the current C-band satellites, within a reasonable cost bound.[44] Thus any competitive concern arising out of higher reimbursement, as argued by Eutelsat, is moot.

- "In the context of a contract to build such a satellite, there is no reasonable way to identify those incremental costs separately from the costs of a hypothetical C-band-only satellite that would serve the CONUS."[45]

- "The complexities in allocating costs of a hybrid satellite … impossible for the Bureau or the Clearinghouse to adequately constrain operators from cross-subsidizing payloads."[46]

Satellite manufacturers such as Boeing and Maxar have filed in the docket stating that satellite manufacturers have "substantial experience designing and building hybrid satellites with multiple payloads and allocating incremental costs among several responsible parties."[47] Thus, the Eutelsat assertion about the difficulty in allocating incremental cost is unsupported by the satellite manufacturers themselves. Allocating such incremental cost is a usual business practice and not a complication for the C-band satellites at issue here. Thus, any potential economic impact that the cost allocation may have on satellite operators is unchanged as it is equivalent to pricing a C-band only satellite. The Commission's proposed incremental cost methodology for allocating costs mitigates any cross-subsidization concerns, as discussed in an earlier section.

Expenses and Announces Process and Deadline for Lump Sum Election," Attach., p. 3, GN Docket No. 18-122, IB Docket No. 20-205, July 30, 2020, https://docs.fcc.gov/public/attachments/DA-20-802A2.pdf ("1 Single Launched C-Band Satellite – 120M-450M").

44 "C-band R&O," ¶ 194.

45 "Eutelsat Comments May 14, 2020," p. 6.

46 "Eutelsat Comments May 14, 2020," p. 5.

47 MAXAR, "Response to Comments on Preliminary Cost Category Schedule WT Docket No. 18-122," p. 2, June 8, 2020. *See also*, Boeing, "Comments On Preliminary Cost Category Schedule Ex Parte Letter, WT Docket No. 18-122," p. 3, May 28, 2020.

V. Conclusion

The overarching principle driving the cost allocation issue is that multiproduct industries with economies of scope have joint costs, and should optimize their joint production decision. Absent this, it will lead to economically inefficient outcomes and duplication of costs. Therefore, the C-band and ancillary-band service production should be jointly optimized. While cost allocation is an important issue for regulated industries, in a competitive context, such as here, prices will be market driven based on marginal costs, so in general, would not be affected by common fixed cost allocation issues. The Commission, to balance various public interest objectives, has adopted an incremental cost allocation approach.

Following the Commission's guidelines, Intelsat will pay for any incremental cost of putting ancillary non-C-band payloads on C-band satellites. To identify incremental costs, Intelsat has calculated the difference between the total cost of a satellite (cost of a C-band plus ancillary band) and the cost of a standalone C-band satellite, and will not seek reimbursement for the difference. This ensures that the government is not subsidizing ancillary payloads. No other allocation methodology is needed, as the incremental cost approach in this context is economically sound and ensures that there is no cross-subsidization of services and thus, no market distortion.

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